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A REVIEW OF THE GENUS ANKOTHRIPS D. L. CRAWFORD (Thysanoptera)

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The present status of the family Melanthripidæ has recently been reviewed by the writer (Pan-Pacific Ent. 15(4):168-172, 1939). Priesner (1936) has prepared a review of the genus *Melanthrips* Hal., and *Dactuliothrips* Moulton is summarized in the first mentioned paper. *Dorythrips* Hood, and *Cranothrips* Bagn. each contain at present only one species. The remaining known genus in this family, *Ankothrips* D. L. Crawford is here reviewed.

Through the kindness of Hood, Priesner, Moulton, and the Canadian National Museum, it has been possible to study types, paratypes, or homotypes of all the known species of *Ankothrips.* Since D. L. Crawford established this distinctive genus in 1909 for *robustus* (designated the genotype by Bagnall, 1913) eight additional species have been described. A key to the known species, the description of a new form, and such biological information as is known concerning the California representatives are here presented.

Bagnall (1913) placed *Dicranothrips* Trybom and *Prionothrips* Schille in synonymy with *Ankothrips.* Hood (1924) pointed out the very interesting coincidence that, "In 1909 and 1910 three students of the Thysanoptera, situated in widely separated parts of the world, described almost simultaneously three species of Æolothripidæ which were remarkable for certain structural characters previously unknown in the group. Each erected a new genus for the reception of the species known to him; yet, oddly enough, though coming from South Africa, Galicia and California, respectively, these three species were congeneric." Priesner (1926, p. 86) reviewed the status of the genus up to that date. The same author (1939) reëstablished *Prionothrips* as a subgenus for *mavromoustakisi* Pr. and *niezabitowskii* (Shille).

The outstanding generic characters which separate *Ankothrips* from other genera in the Melanthripidæ are as follows: The projection of the second antennal segment, the anterior pro-

jection of the vertex, the lack of tarsal claws and tibial spurs, and the transverse horse-shoe shaped sensory areas on antennal segments III and IV.

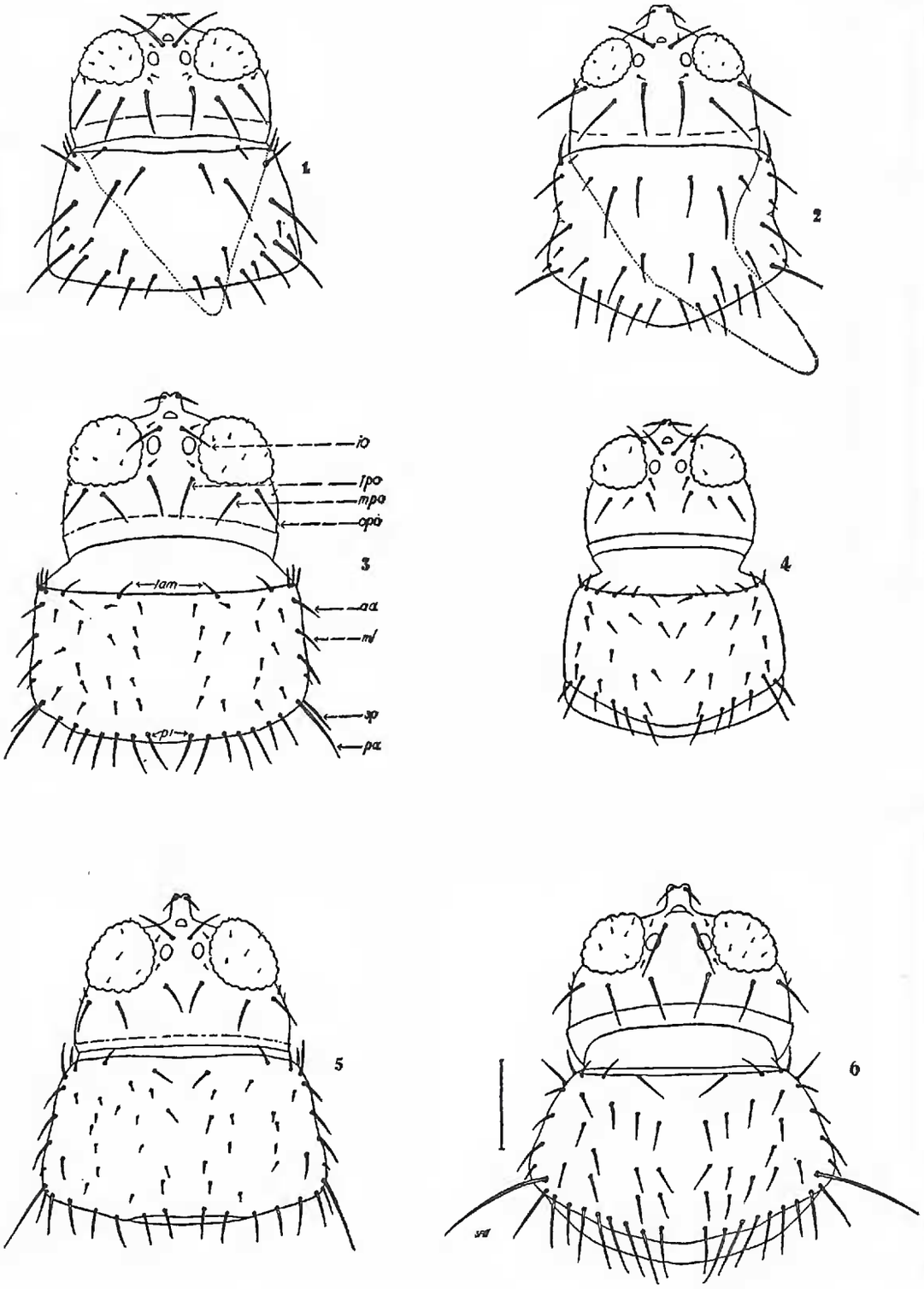

Plate I. *Ankothrips.* Head and pronotum of: 1, *niezabitowskii*; 2, *mavromoustakisi*; 3, *vandykei*; 4, *gracilis;* 5, *æqualis*; 6, *notabilis.* Scales: Plate II, Figure 3, line equals 0.1 mm. All other figures in Plates I, II, and III are to same scale as in Plate I, fig. 6, Plate II, fig. 4, and Plate III, fig. 9, i.e., line equals 0.1 mm.

The diversity in the genus is not great, although the individual species exhibit considerable variability when studied in long series. For example, occasional individuals are seen with the antennal projection missing on one or both antennæ, the notches or serrations on the antennal projections are variable, and the number of bristles on the pronotum sometimes fluctuates.

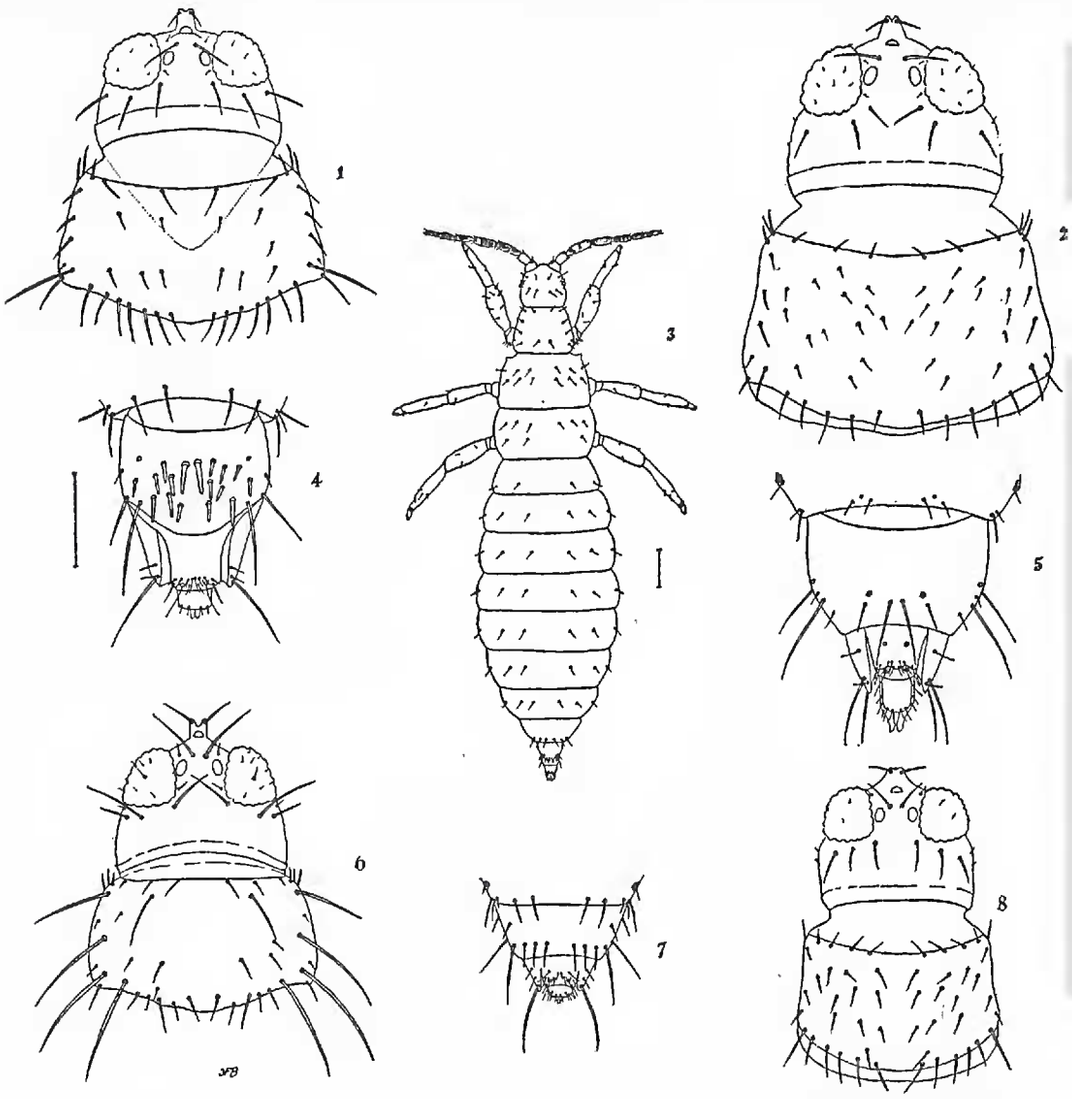

Plate II. *Ankothrips.* Head and pronotum of: 1, *robustus*; 2, *yuccæ*; 6, *fissidens*; and 8, *diffractus.* Genitalia of males of: 4, *robustus*; 5, *yuccæ*; and 7, *gracilis.* Figure 3, mature larva of *yuccæ.*

In the known males of those species having very heavy bristles on the dorsum of the terminal abdominal segments, namely, *æqualis* Moulton, *robustus* D. L. Crawford (Plate II, fig. 4), and *notabilis* Bailey, there is also variability in the number and placement of these bristles. As the males of more species become known the genitalia (Plate II, figs. 5 and 7) will be used more successfully than is now possible. Good specific char-

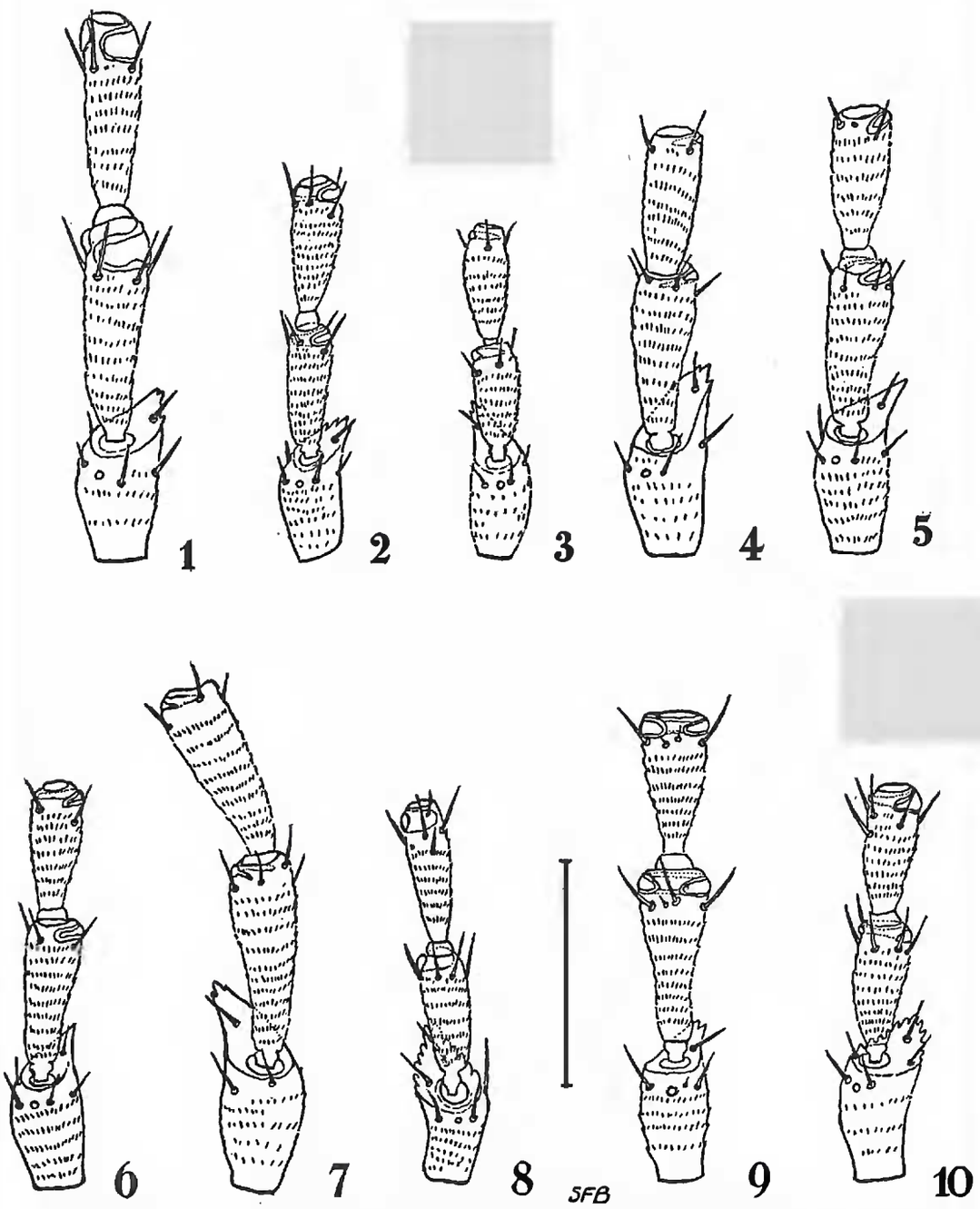

Plate III. *Ankothrips.* Second, third, and fourth antennal segments of: 1, *yuccæ*; 2, *gracilis*; 3, *diffractus*; 4, *vandykei*; 5, *notabilis*; 6, *robustus*; 7, *æqualis*; 8, *mavromoustakisi*; 9, *fissidens*; and 10, *niezabitowskii.*

acters are also to be found in the chætotaxy of the pronotum and dorsum of the head. It should be noted that the antennal sensory areas on the third and fourth segments do not offer such distinct specific characters as in *Melanthrips* although there are marked differences (Plate III, fig. 1-10). The nomenclature of the bristles of the pronotum as here used is adapted from Priesner (1936) (Plate I, fig. 3).

KEY TO THE SPECIES OF ANKOTHRIPS

1. (10) Mouth cone very long and pointed, extending considerably beyond posterior margin of pronotum (Plate I, figs. 1 and 2). Ovipositor very long.....Subgenus *Prionothrips* Pr. 10
—. Mouth cone short and blunt, not extending beyond posterior margin of prothorax (Plate II, fig. 1).....2
2. (1) Projection on vertex over-hanging base of antennæ wider at base than at tip (Plate II, fig 2).....3
—. Projection of vertex over-hanging base of antennæ with sides parallel[1] (Plate II, fig. 6).....6
3. (2) Sensory areas on antennal segments III and IV very broad, about one-fifth the length of the segment and extending almost entirely around the segment (Plate III, fig. 1). Projection on antennal segment II toothed or serrate on outer margin only. .....*yuccæ* Moulton
—. Sensory areas on antennal segments III and IV narrow and extending little more than half way around segment at tip....4
4. (3) Median post-ocular bristles very short (0.016 mm.) and with micro-setæ between inner margin of eye and anterior ocellus strongly developed (Plate I, fig. 4).....*gracilis* Moulton
—. Three post-ocular bristles well-developed.....5
5. (4) Posterior-angular bristles (pa) on pronotum 0.075 mm. long; sp bristles 0.052 mm.; with three strong lateral bristles on pronotum (Plate I, fig. 3).....*vandykei* Moulton
—. Pa bristles 0.052 mm.; sp bristles absent; lateral bristles on pronotum weak or absent (Plate II, fig. 8)....*diffractus* Hood
6. (2) Projection of vertex with a deep U-shaped notch at tip (Plate II, fig. 6). Median post-ocular bristles longer (0.072 mm.) than the inner or outer ones. Mid-lateral bristle (ml) very long (0.089 mm.).....*fissidens* (Trybom)
—. Projection of vertex with shallow V-shaped notch.....7
7. (6) Projection on second antennal segment simple—without notches or serrations on margin.....8
—. Projection on second antennal segment notched on one or both sides near tip 9
8. (7) All bristles on head and pronotum strongly developed; inter-ocular bristles 0.069 mm., pa bristles very long (0.115 mm.) (Plate I, fig. 6). Pronotum and portions of head, legs, and thorax golden yellow.....*notabilis* Bailey
—. Bristles on head and pronotum moderately well developed; interocular bristles 0.049 mm.; pa bristles 0.085 mm. (Plate II, fig. 1). Body uniform dark brown.....*robustus* Crawford
9. (7) Projection on vertex slightly wider at base than at tip. Pronotal bristles iam 0.023 mm. Interocellar bristles 0.046 mm. (Plate I, fig. 3). Color yellow to orange brown.....
.....*vandykei* Moulton

[1]Measurement of the one paratype of *vandykei* in the writer's collection shows the projection to be slightly wider at the base than at tip; width at tip 0.022 mm., width at base 0.028 mm.

—. Projection on vertex more slender with sides straight. Pronotal bristles iam 0.029 mm. Interocellar bristles 0.039 mm. (Plate I, fig. 5). Color yellow to orange-yellow with bristles dark brown; abdominal segments 2–7 each with dark brown transverse line on anterior margin of sternum..... ..... *æqualis* Moulton

10. (1) Ovipositor 0.637 mm. long. Head produced in front of eyes and projection with sides nearly parallel (Plate 1, fig. 2). Antennal segments I and II light brown, remainder dark brown ..... *mavromoustakisi* Pr.

—. Ovipositor 0.455 mm. long. Head scarcely produced in front of eyes and projection with base much wider than tip (Plate I, fig. 1). Antennal segment I light brown, remainder dark brown..... *niezabitowskii* (Shille)

Ankothrips notabilis Bailey, new species

Plate I, fig. 6. Plate III, fig. 5.

Female: Basal portion of head with dark brown collar, remainder light brown to golden brown. Prothorax yellow to golden brown; remainder of body uniform dark brown. Eyes dark brown to black, marginal ocellar pigment crimson. Antennæ dark brown, base of segment III light brown to gold, segments I and II somewhat lighter than anterior segments. Femora dark brown, yellowish-brown at tip. Tibiæ light golden brown, middle and hind tibiæ darker in center. Wings fuscous, hind wing lighter than fore wing. Bristles moderately strong, dark brown to black at tip of abdomen, light brown to gold on remainder of body.

Head about one-third wider than long, cheeks pronouncedly arched behind eyes, with a collar-like ridge at posterior, microsetæ on compound eyes between facets. Three ocelli, anterior ocellus at base of projection and directed forward. Head transversely reticulate behind eyes. Mouth cone short and rounded. Antennæ moderately slender, nine-segmented. Segment II projected on under side in the manner typical of the genus. Rings or annulations on all segments but indistinct on segment I. Segments III and IV with narrow sensory band at tip extending two-thirds of distance around segment. *Prothorax* about one-third wider than long, bristles long and well-developed. Fore and middle tibiæ with two short spines at tip. Hind femora thickened. Wings broad and rounded at tip, entire surface of both wings covered with micro-setæ. Fore wing with two longitudinal veins and three distinct cross-veins; fore longitudinal vein with 25-30 bristles, posterior longitudinal vein with 22-26 bristles. Hind wing with a thickening near base on costal margin and a central vein or darkened area extending a short distance from base. *Abdomen* broadly ovate, bluntly rounded at tip. Transverse striations weak on dorsum of all segments except first.

Measurements of type: Total body length (exclusive of antennæ): 1.89 mm.; head, length (including projection) 0.15 mm.; width, 0.19 mm.; prothorax, length 0.15 mm., width 0.27 mm.; mesothorax, width, 0.37 mm.; abdomen, greatest width (at 4th segment), 0.40 mm. Length of antennal segments in mm.: I, 0.029; II, 0.052; III, 0.079; IV, 0.066; V, 0.049; VI, 0.052; VII, 0.029; VIII, 0.019; IX, 0.033; total length (including intersegmental membranes), 0.455. Length of spines in mm.: io, 0.056; ipo, 0.049; mpo, 0.042; opo, 0.049; iam, 0.036; aa, 0.046; ml, 0.033; pl, 0.049; sp, 0.062; pa, 0.095.

Male: Smaller and more slender than female. Tip of abdomen spatulate and turned upward. Total body length (including projection on vertex) of allotype 1.65 mm.

Described from nineteen females and ten males collected by the author in California laurel flowers in Mix Canyon, Solano County, California, on February 1 and 14, 1939. Additional specimens of the type series are in alcohol, as well as a long series of slides from the same locality from manzanita and plum blossoms, February and March, 1935 and 1936. This species has also been collected by the writer from Arroyo Seco, Los Angeles County; on Ceanothus, near Wilbur Springs, Colusa County; on manzanita, at McDonnell Creek, Sonoma County, California. Additional specimens have been collected by R. M. Bohart at Cajon Pass on Ceanothus and by W. A. Brereton in San Gabriel Canyon from "flowers of a woody shrub."

Type locality, Mix Canyon, Solano County, California. Holotype slide (T16) and allotype (T17) in writer's collection.

The complete life history of none of the species of this genus of thrips has been worked out in detail. However, during the past eight years, the writer has collected and observed *robustus*, *gracilis*, *yuccæ*, and *notabilis* in California and a few generalizations can be made regarding their biology. These species have only one generation a year which is correlated with the blooming of their native hosts. The earliest species to appear, following the rains of the winter season (in January) is *notabilis*. Later *robustus* appears and it may be found up to May at altitudes of about 3,000-4,000 feet. In April, May, and June, *yuccæ* may be found in yucca flowers, particularly in southern California. The preferred host of *gracilis* appears to be *Adenostoma fasciculatum* and this thrips is to be found commonly in its flowers in May and June. Judging from these four species, these thrips are plant feeders only. The larvæ are

found in the late blooms of the host plants and disappear rapidly as the blooming period passes. The larval period lasts about two weeks.

In the laboratory the larvæ of *yuccæ* and *gracilis* have been found to spin cocoons in the soil. Therefore, it is safe to say that in the field pupation occurs in the soil beneath the hosts. The life history of these species may be compared with that of the pear thrips, *Tæniothrips inconsequens* (Uzel).

As in the case of the above-mentioned crop pest, these *Ankothrips* species fluctuate greatly in numbers from year to year. When conditions are favorable the larvæ of *yuccæ* (Plate II, fig. 3) may be found by the thousands in yucca flowers. The most widespread species in California appears to be *robustus*; *gracilis* and *yuccæ* can be considered common, *notabilis* common in certain definite, widely-separated localities, and *æqualis* is rare. The latter species is apparently known only from the original collection; it may be found to be a coastal species only. Concerning the other two North American species, *diffractus* and *vandykei,* nothing is known except the data of the original collections.

The exotic species, *fissidens*, *neizabitowskii* and *mavromoustakisi,* appear to be common and also occur in numbers in the spring only.

Insufficient data are at hand to formulate any general conclusions relative to the world distribution of this genus. Nevertheless, it should be pointed out that in North America this group of thrips is known only from the arid, semi-desert regions. Further and more thorough early spring collecting in other regions having a similar climate in western North America, as well as in South America and Africa, will undoubtedly disclose additional undescribed forms.

Catalog of the Species of Ankothrips

1. *A. robustus* D. L. Crawford. 1909. Genotype. North America (California—widely distributed). Common in flowers of *Ceanothus* and manzanita; also found in prune blossoms and by sweeping.
2. *A.* (*Prionothrips*) *niezabitowskii* (Shille). 1910. Poland and Hungary. February to May on *Juniperus communis.*

3. *A. fissidens* (Trybom). 1910. (*Dicranothrips*). South Africa (Klein-Namaland). August, from leaves of "Pferdebusches." Form *major* taken in July on leaves of "Zuur-Klee."
4. *A. diffractus* Hood. 1924. North America (New Mexico). In May in flowers of *Cercocarpus montanus* Raf. (7600 feet).
5. *A. yuccæ* Moulton. 1926. North America (California). Common in spring in flowers of native yucca, chiefly in southern California (also Kern County).
6. *A. gracilis* Moulton. 1926. North America (California). Common in late spring and early summer in flowers of *Adenostoma fasciculatum.*
7. *A. æqualis* Moulton. 1926. North America (California and Washington). April and June. Recorded hosts are *Prunus*, *Spiræa corymbosa*, *Schizonotus discolor*, and *Sambucus glauca.*
8. *A. vandykei* Moulton. 1928. North America (Colorado). In June from unknown plant.
9. *A.* (*Prionothrips*) *mavromoustakisi* Pr. 1939. Cyprus. February, in turf with juniper trees nearby.
10. *A. notabilis* Bailey. North America (California). January to March in flowers of *Umbellularia californica* and *Ceanothus.*

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ORNITHODOROS TURICATA IN CALIFORNIA

(Arachnida, Acarina)

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While working last summer for the George Williams Hooper Foundation for Medical Research, University of California, the writer collected a specimen of a tick which has since been identified as *Ornithodoros turicata* (Duges, 1876). This is the first time since 1908 that this species has been definitely found in California.

The tick was originally described by Duges from Mexico in the newspaper le Repertorio de Guanajuato. Banks in 1908 reported it from Florida, New Mexico, Arizona, and San Diego, California. In the last two instances it was taken from cattle. Several workers including Brumpt (1936), Neveu-Lemaire (1938), and Bishopp (1933) have suggested the presence of this tick in considerable numbers in California, particularly in the southern portion of the state, but as far as can be determined they were evidently making use of Banks' early publication. At the present time it is also reported to occur in Kansas as well as in the states previously mentioned.

The specimen in question, an early nymphal form, was collected from the ground squirrel, *Citellus beecheyi fisheri* Merriam,